

# STUDENTS AND GRADUATES EXCHANGE PROGRAMMES IN THE CHEMICAL ENGINEERING DEPARTMENT OF THE UNIVERSITY OF COIMBRA IN PORTUGAL

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## Abstract

Undergraduate exchange programs have been active in Europe for quite some time and, as a consequence, the Portuguese university students have been profiting from those programs since long. In the Chemical Engineering Department of the University of Coimbra we have been engaged in those programmes, mainly with European universities, for at least 15 years. In this paper we will report that experience, giving notice of its importance to the education of our chemical engineering students. Additionally, we will discuss also the importance to the education of our chemical engineers of the contact with the incoming students from those programs, spending a period of their studies in the University of Coimbra. Notice will also be given to the more recent mobility programs involving industrial partners which allow our young Chemical Engineers a training period in a European company outside his home country or, still, short training periods abroad to undergraduate students. Finally, the new trends and targets at the EU level regarding the mobility of the young people, namely engineering students and young graduates will also be addressed in this paper.

## Introduction

Undergraduate exchange programs have been active in Europe for quite some time and, as a consequence, the Portuguese university students have been profiting from those programs since long ago. In the Chemical Engineering Department of the University of Coimbra we have been engaged in those programmes, mainly with European universities, for at least 15 years.

These exchanges have been sponsored by the European Union, first under the **Erasmus Program** (since mid 1980s) and later, since 1995, under the **Socrates/Erasmus Program** which has got a broader scope since it includes also exchange of staff members, development of joint degrees (Erasmus Mundus Program) and, more recently, mobility traineeship in industry of undergraduate students and also mobility for life long learning and students exchange at the secondary school level.

With the implementation of the Bologna Process in The European Union (EU) Universities, the emphasis put in mobility is still stronger. A recent report from a group of experts gathered by EU (1) recommends that by 2020 at least 50% of all young people aged 16-29 in the EU should be offered the opportunity to engage in some form of cross-border mobility.

It is believed that besides the positive effects learning mobility can have on the personal development of young people, there is a more general dimension to it. Mobility does not only help exchange and circulate ideas; it can also break down barriers between people and groups and add to a sense of European citizenship. Thus, this forum of experts calls for further strategic action to address barriers to mobility and to engage in a new partnership all the stakeholders of the EU Member States: governments, education institutions, business and civil society.

In this paper we will report the experience of having undergraduate students or young graduates from the Chemical Engineering Department of the University of Coimbra involved in mobility

programs, giving notice of its importance to the education of our chemical engineering students, not only because it gives them access to chemical engineering fields not covered in our university, but mainly because it allows them an international experience, which we repute very important for their employability and future attitude in their profession as chemical engineers.

## **The Experience of the Chemical Engineering Department of the University of Coimbra**

The Chemical Engineering Department of the University of Coimbra (ChemEng/UC) has been involved in students exchange at the undergraduate level, in the framework of EU programs, for at least 15 years. In the beginning the mobility was just from the University of Coimbra to other European Universities, namely to the University of Leeds, UK, University of Delft and University of Eindhoven, the Netherlands, University of Murcia, Spain, etc. Moreover, the number of outgoing students every year was small, being mainly final year students developing one semester of their final project in a foreign university. In fact, in the earlier years of this experience, and till very recently (only two years ago) the students had to obtain equivalence from the University of Coimbra for each course taken abroad, which required approval of the professor responsible for the equivalent course in the University of Coimbra.

Lately, several changes have been occurring at the two levels: outgoing and incoming students. Referring to the outgoing students and following the adoption of the Bologna Process, the students go out with a one or two semesters complete program, prepared with the help of the Erasmus coordinator in the ChemEng/UC. Thereafter they get equivalence from the University of Coimbra for the corresponding semester/year rather than course by course. This is expected to increase the number of outgoing students every year compared to what was happening previously, which, in fact, is already occurring. During the last ten years and till 2006/07 we have been sending abroad an average of two students per semester. In the school years 2007/08 and 2008/09, we have been having abroad four students per semester. Moreover, these students are no longer students belonging only to the final year of their degree (5<sup>th</sup> year), as used to happen traditionally, but are now students from the 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> years of our integrated MSc degree, according to the Bologna nomenclature, though it is true that the 5<sup>th</sup> year students are still the majority of the candidates.

Referring to the incoming students we started receiving undergraduate students from other European Universities in 2001/02, in the beginning only from Spanish Universities. The number of incoming students has also been increasing and, currently, we receive an average of four foreign students per semester from European Universities of the most different countries: UK, Austria, Romania, Italy, Spain, the Netherlands, etc.

A similar trend as that observed regarding the outgoing students can be observed for the incoming ones. Initially those students would come just to develop their final year project in the University of Coimbra during one semester. Nowadays, they are already coming with a one or two semesters program, which means that they will take a set of pre-defined courses.

One of the limitations that still prevents more foreign students to get engaged in a full semester of the Chemical Engineering curriculum in Coimbra is the language barrier, since courses are still taught in Portuguese. Two strategies are being pursued to help those students: first they enroll in an intensive Portuguese course provided by the University itself, two or four weeks before the beginning of the Chemical Engineering classes; secondly, when the teacher is aware of the presence of non-Portuguese speaking students in the class he volunteers to teach in English.

However, a more radical change is envisaged in the very near future: teaching in English at least for the second cycle of the Bologna format (4<sup>th</sup> and 5<sup>th</sup> year of the integrated MSc in our degree). In fact, the language is still by far the main barrier to receiving more foreigner students in mobility in the Chemical Engineering Department of UC. One of the events aimed at making the integration of the foreign students easier and better, which started also in the school year 2007/08, is the organization of a welcome week for the mobility students of the whole University, organized by the international relations office.

The opinion of all our students that have been involved in mobility programs during the last ten years has always been very positive, with the recognition by them of the advantages of contacting different realities both at the university level and in general at the social level. They also recognize the advantages for their mastering of the English language and enhancement of personal autonomy. A small percentage of those students have even been involved more than once in mobility programs: in an intermediate year and in the final year of the degree for the final year project, or even after graduation as will be described later.

Also very positive is the opinion of our students to the contact with the incoming students. Usually these students are integrated in mixed teams including also Portuguese students. Again, they stress the benefits for the Portuguese students of this interchange of experiences with students coming from different cultures, as well as the benefits to the mastering of the English language. It must be stressed that our local Portuguese Chemical Engineering students are a big help to the integration of the foreign students that come to ChemEng/UC through mobility programs.

A more recent experience is with the mobility of incoming students from Brazil. A recent agreement between the University of Coimbra and Brazil (a Portuguese speaking country) is enabling Brazilian students, from a set of pre-determined universities, to be involved in mobility programs with the University of Coimbra, at the undergraduate level, since, at the graduate level (MSc and PhD) that mobility has been going on since long ago. In the Chemical Engineering Department of the University of Coimbra we have received the first group of Brazilian students in the school year 2006/07 (coming from the Universities of Campinas, S. Paulo and Santa Catarina). We have been receiving 2-3 students per year since then, either for one or two semesters. Although they report the experience as positive, there are still changes to introduce, namely learning from the Socrates/Erasmus Program. In spite of these students coming through an agreement between the University of Coimbra and their home University, when they go back they sometimes face problems with the recognition of the courses they performed in Portugal, because some of the home professors still requiring a complete agreement, course by course, between the programs in Portugal and in Brazil. An effort has to be put in preparing at home, and through the dialogue between the staff members responsible for the exchange program in each university, a complete curriculum for the semester or school year that will be recognized as a whole by the partner university without a need for recognition course by course.

It must also be stressed that we have a large and long experience of receiving students, in the Chemical Engineering Department of UC, from the African Portuguese speaking countries but, in this case, enrolled for the whole degree and not on mobility. The number of these students we accept every year has also been increasing.

More recently, during the last five years, we have been involved, simultaneously, in another exchange program, funded also by the European Community, this time directed to graduates, in our case graduated chemical engineers: the Leonardo da Vinci Program. This program allows us to send our recent graduates, during the year after their graduation, to European companies or research institutes adhering to the program, and thus give to our engineers access to a first international professional experience.

We have been sending an average of 6 young graduates every year (on average we graduate 35-40 Chemical Engineers per year) to European companies in UK, the Netherlands, Germany, Italy, Spain, etc. for training periods around six months. All the chemical engineers involved report very positive experiences. At the end of the training period there is also a report supplied by the company and, so far, the evaluation by the companies has also been very positive. In three situations the young graduates have even been offered a position in the company and one of them (a young female) accepted it and stayed with Procter & Gamble. So, it can be said that the experience is proving fruitful for both sides.

This mobility program relies a lot on the contacts the staff members (Professors and Researchers) have got with companies outside Portugal, in Europe. The staff members supply their contacts to the international relations office which then establishes the agreement with the company. The graduate receives a monthly allowance, fund for the travel costs, and is entitled to insurance and a paid language course in the language of the country. The company itself is obliged to assist the graduate in finding an accommodation.

These periods of training abroad constitute a plus in the CV of the Chemical Engineering graduates from the University of Coimbra, being quite valued by the Portuguese employers.

Additionally, and starting this school year, a new program, also under the Leonardo da Vinci funding scheme, has been launched. This time the program aims at supporting training experiences of undergraduate students, namely chemical engineering students, in European companies, for periods of two to three months, during the summer vacations. We are also institutionally engaged in that program though, so far, these training periods will be considered as extra-curricular work, which will, nevertheless, be included in their official diploma supplement, a document the university has to add to each graduate certificate describing his or her entire education course in the university. The possibility of considering these international summer trainings as curricular work is being discussed. Since this will be the first year in which students have got the possibility to get engaged in this program, it is impossible, at this moment, to make any kind of assessment.

To finalize we must recognize that in spite of the long experience described above, of involvement of the Chemical Engineering Department of UC in mobility programs (several types), the number of students that get involved, at least once during their degree, in those programs, is still unsatisfactory (less than 10% of the graduates). The same is felt all around EU where the average is of 6% of University students per year in whatever type of mobility action. So, the general feeling is that a lot has still to be done to promote mobility in education.

## **Conclusions**

The well known practice of the European Universities to engage their students in mobility programs has been increasing over the years, namely motivated by EU programs (Socrates/Erasmus and Leonardo da Vinci).

The Chemical Engineering department of the University of Coimbra has adopted that practice since long ago, starting firstly only with outgoing students and, more recently, with incoming students.

The latest trends of these mobility programs are, nowadays, towards the involvement also of the industrial sector, enabling, in this way, that either young graduates or undergraduate students can spend training periods in industrial or services companies in European countries other than their home country.

These practices have been rated very positively by the students or engineers involved and also, in the last case, by the companies collaborating with the universities.

Moreover, the Portuguese students were also very positive about the exchange of experiences with the incoming students visiting the ChemEng Department of UC.

Some lessons have been learned over the years, the main one being that the student exchange program must be prepared and agreed to in advance, between the two universities involved, so that there is no problem with the recognition of the courses attended in the host university. The recognition should be granted to either the semester or the school year rather than to individual courses, in line with the recommendations of the Bologna Process.

Another lesson is that language can be a barrier for mobility. Thus, in the Portuguese case it is advisable that courses, at least second cycle courses, be taught in English in order to attract more incoming students.

To conclude, it is generally agreed that besides the positive effects learning mobility can have on the personal development of the students, there is a more general dimension to it. Mobility can help exchange and circulate ideas as well as on intercultural know how, breaking down barriers between people and groups.

Thus, at the European level, with the aim to best equip young people with skills and competences needed in the future, in a competitive and knowledge based society, the target is to have, in 2020, 50% of all young people aged 16-29 being offered the opportunity to engage, at some point, in some form of cross-border mobility. To achieve this goal it is necessary to promote more strongly mobility programs, increasing the synergies between the different programs available at the moment in EU.

Moreover, mobility with non-European countries is also recommended, as already is happening at the research level, namely with other Portuguese speaking countries which, so far, have only been supplying incoming students.

### ***References***

1. “Making Learning and Mobility an Opportunity for All”, report of the high level expert forum on mobility, coordinator Maria Joao Rodrigues, EU, June 2008.